Office of Research and Development's Programs and Opportunities in support of Cool Pavements

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RESEARCH & DEVELOPMENT

Building a scientific foundation for sound environmental decisions

Outline

- Technology for a sustainable Environment
- Small Business Innovation Research
- Global Change
- P3 Award: A National Student Design Competition for Sustainability

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Technology for a Sustainable Environment (TSE)

- EPA and NSF partnership since 1995
- Competitive awards
- Fundamental and applied research
- Focus is advanced and novel environmentally benign methods for industrial processing and manufacturing
- 204 projects totaling $60.7 million ($27.1 million from EPA and $33.6 million from NSF)

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TSE Details

- TSE includes pollution prevention through green chemistry, green engineering, industrial ecology, design for environment, source reduction,…
- Preferred approach to risk management and crucial to moving towards sustainability
- Innovative alternatives with realized environmental and economic benefits – furthering economic growth and environmental improvement
- Inherently benign chemicals, materials, and energy for reduced risks, liabilities, accidents, and vulnerabilities
- Pre-competitive research
- Voluntary action rather than regulations changing EPA's relationship and dialogue with the private sector

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TSE Topics

- Chemistry, Bioengineering, and Chemical Reaction-Based Science and Engineering for Pollution Avoidance or Prevention;
- Non-Reaction-Based Engineering for Pollution Avoidance and Prevention;
- Environmentally Benign Systems and Design, Manufacturing, Processing, and Industrial Ecology for Sustainable Product/Services Realization; and
- Sustainable Construction Processes

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TSE Examples

- Immersive design applications with the “iDesign” software in structural engineering, interior design, above-ceiling coordination, and architectural design
- Life cycle analysis of construction processes and management strategies
  - An Integrated Quantitative and Qualitative Life Cycle Cost Assessment Technology for Cost Benefit Evaluation of Bridge Deterioration, Renewal, and Rehabilitation

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Small Business Innovation Research (SBIR)

- Set-aside program for small businesses to engage in federal R&D
- Promote commercialization
- Budget = 2.5 % of Federal R&D Budget
- Over $ 2 Billion in 2004

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SBIR Eligibility

- Organized for-profit business
- At least 51% U.S.-owned
- Located in the U.S.
- 500 or fewer employees

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SBIR logistics

- Phase I
  - Proof of Concept
  - $70,000
  - 6 months
- Phase II
  - Develop Phase I technology with focus on commercialization
  - Up to $345,000 (with options)
  - 2 years

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SBIR priorities

- Innovation in Manufacturing
- Nanomaterials
- Pollution Prevention
- Water and Wastewater Management
- Green Buildings
- Safe Buildings
- Drinking Water and Wastewater Security
- Computational Toxicology
- Lead Paint Detection and Remediation

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SBIR Examples

- Cement-Polymer Composites From Recycled Polymers for Construction – Mer Corporation
- Development of Recycled Glass Paving Materials – Sandhill Industries
- A Novel Method for Converting a Negative Value Waste into a Commodity Chemical – Lynntech
- Cement-Polymer Composites From Recycled Polymers for Construction Applications – Mer Corporation

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Global Change

- Regional Development, Population Trend, and Technology Change Impacts on Future Air Pollution Emissions
  (closed - 4 awards; total $2.4M)
- The Impact of Climate Change & Variability on Human Health
  (closed – 4 awards; total $3M)

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Global Change examples

- Modeling the Effects of Land Use and Technology Change on Future Air Quality in the Upper Midwestern United States
- Air Quality, Emissions, Growth, and Change: A Method to Prescribe a Desirable Future

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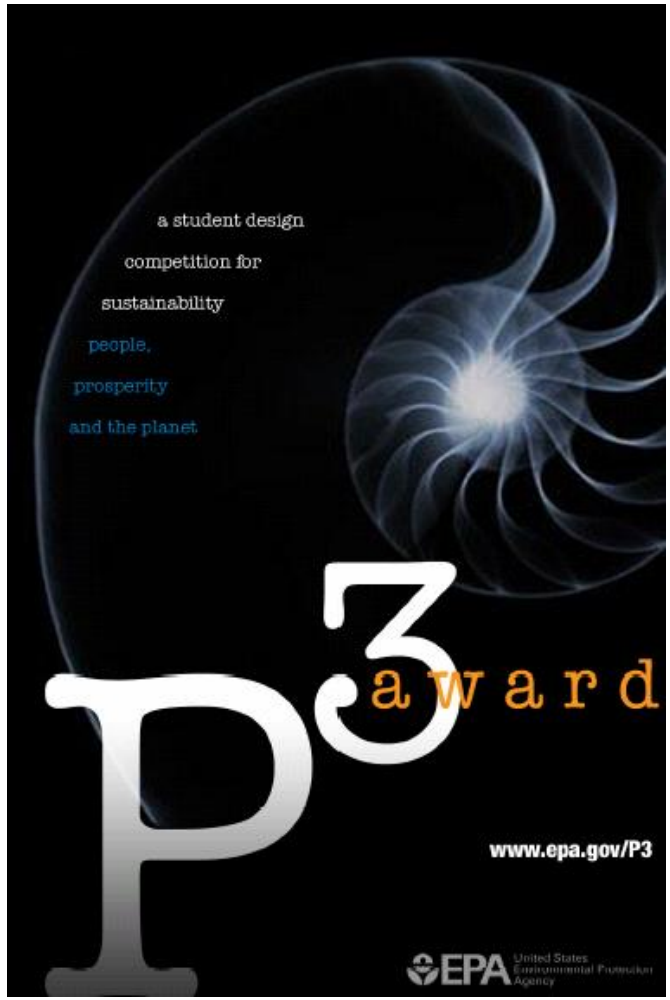
P3 Award

(People, Prosperity, and the Planet)

- Scientific and technical challenges to sustainability in the developing and developed world
- 40 partners including industry, NGOs, professional societies, other government
- **Phase I - 66 interdisciplinary student design projects**
- NAE will convene a panel of judges and select winners (May 2005)
- Phase II – P3 Awardees will be eligible for additional funds from EPA to match contributions from industry or NGOs for implementation



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University of Cali
Background
Fermin Reygadas,
The UV-Tube is a household or neighborhood-scale water
(UV) radiation to inactivate harmful microorganisms.
People. UV-Tubes are fast and easy to use, providing 5
without changing its taste. Water treatment can reduce waterbo
Prosperity. UV-Tubes can be made locally for < $50 using s
be built and sold by local small businesses or used in a water tre
Planet. The 15W UV-Tube requires only a fraction of the ener
Educational tool: The UV-Tube is now a Engineers for a Susta
a "Brainstorm and Build" Workshop (Jan '05) and sponsored a
Sustainable Communities" course. UV-Tube design will be a proj
Purpose
Phase I Objectives
Develop and validate 3 UV-Tube designs in the lab.
Conduct workshops where users build stainless steel-lined-PVC (ss-PVC) UV-Tubes.
Field test ss-PVC UV-Tube in Mexico.
Assess user demand and preferences as well as perception of health.
Study bulb performance under real conditions.
Leverage UV-Tube design as a pedagogical tool to encourage more sustainable design curriculum at UCB.
Cambodia
Results
SS-PVC UV-Tube provides more than 2x the NSF/ANSI Standard Dose of 400 J/m².
LOG inactivation of Common Microorganisms at Various UV Doses
Escherichia coli (indicator)
Vibrio cholerae (cholera)
Salmonella typhi (typhoid fever)
Poliovirus (polio)
Hepatitis A virus
MS2 Colifage (indicator)
Giardia muris
Cryptosporidum parvum
Ascaris (roundworm) eggs
1 LOG (90%)
2 LOG (99%)
3 LOG (99.9%)
4 LOG (99.99%)
ss-PVC UV-Tube Dose at 5 L/min 939 x122 J/m²
UV Dose (J/m²)
3 Tracer Tests, ss-PVC UV-Tube at 5 L/min
% of Dye Exiting
Time (s)
3 UV-Tubes installed in Mexico...
Key Learnings:
1. UV-Tubes used regularly for 9 months in homes.
2. Less demand where bottled water is heavily promoted. Rural areas are more promising.
3. Irregular current can cause ballast and lamp failure.
4. Aesthetics could be improved (smaller).
Near plug flow and minimal short circuiting.
UCB Students developed new designs at the Brainstorm and Build Workshop.
Washington, DC
P3

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P3 examples

- High albedo and environment-friendly concrete for smart growth and sustainable development
- Development of Appropriate, Sustainable Construction Materials
- Using An "Impervious Permit" Allowance System To Reduce Impervious Surface Coverage for Environmental Sustainability

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Looking ahead

- Technology for a Sustainable Environment has not been in the President's budget request since 2003
- SBIR will continue at 2.5% set aside
- Global Change will continue at about $2-3M per year
- P3 Award funding is currently in progress